Chapter 5

Uif Module

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External Signals and Connections

Table 1. To Radio Module

Signal Name	Pin / Conn.	Notes
VL1	1	Logic supply voltage 3.15V
GND	2	Ground
V_{BATT}	3, 30	Battery voltage
BACKLIGHT	4	Backlights on/off
UIF(0:6)	5 – 11	Lines for keyboard read and LCD–controller control
MIC_ENA	12	Microphone bias enable
COL(0:3)	13 – 16	Lines for keyboard write
CALL_LED	17	Call led enable
MICP	18	Microphone (positive node)
MICN	19	Microphone (negative node)
EARP	20	Earpiece (positive node)
EARN	21	Earpiece (negative node)
BUZZER	22	PWM signal buzzer control
XPWRON	23	Power key (active low)
VA2	24	Analog supply voltage 3.15V
NC	25,27,28	
V_{LCD}	26	Supply voltage 4.0V for the LCD driver
AGND	29	Analog ground for the microphone

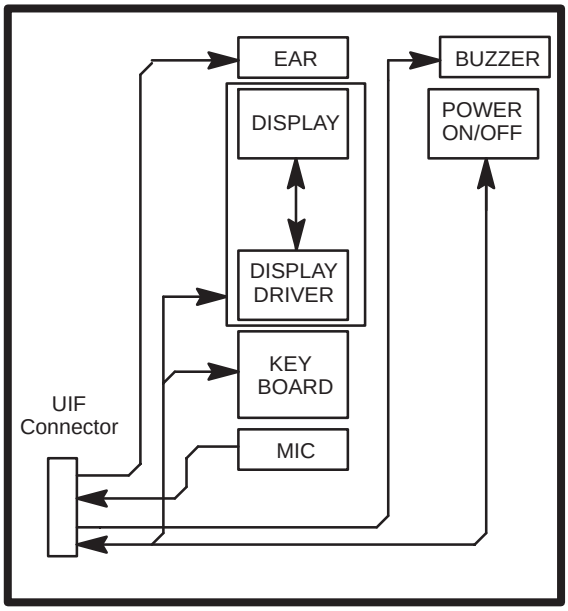

Figure 1. UIF Interconnection Diagram

Table 2**.** UIF Connector

Signal Name	Pin / Conn.	Notes
3VD	1	Logic supply voltage 3.15 V
GND	2, 29	Ground
VBATTERY	3, 30	Battery voltage
BACKLIGHT	4	Backlights on/off
UIF(0:6)	5 – 11	Lines for keyboard write and LCD–controller control
MIC_EN	12	Microphone bias enable (open drain, active low)
COL(0:3)	13 – 16	Lines for keyboard read
CALL_LED	17	Call led enable
MICP	18	Microphone (positive node)
MICN	19	Microphone (negative node)
EARN	20	Earpiece (negative node)
EARP	21	Earpiece (positive node)
BUZZER	22	Buzzer control
ONKEYX	23	Power key (active low)
3VD	24	Analog supply voltage 3.15V
LCD_PWR	26	LCD supply voltage
SUNLIGHT	25	Connection to CALL LED for ambient light measurement
NC	27,28	NO CONNECT

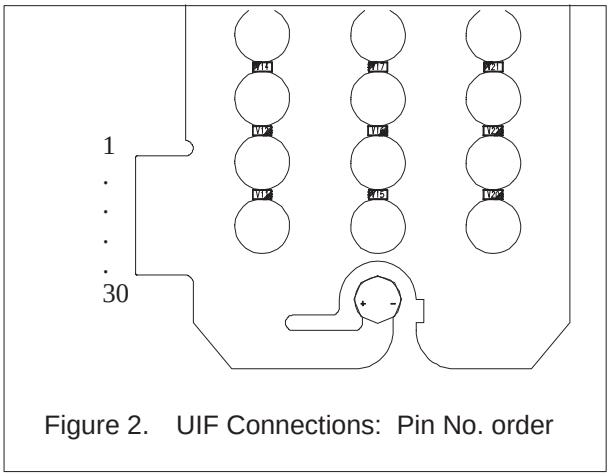

Figure 2. UIF Connections: Pin No. order

Table 3. To LCD Module

Pin	Signal Name	Notes
1	GND	Ground
2,3	OSC1, OSC2	Oscillation terminals
4–8	V1–V5	LCD driving power source
9	V5OUT	Negative voltage converter output
10–11	C1, C2	4.7 uF capacitor to generate negative voltage for the input voltage VCI
12	VCI	Power source for voltage converter
13	VCC	Power source
14	RS	Register selection
15	R/W	Read/write
16	EN	Enable for read/write signal
17–20	D(0–3)	Data bus
21–24	D(4–7)	Data bus

Functional Description

Circuit Description

Main components on the DU8 module

The module is connected with a 30 pin flex connector to the system board and a 24 pin connector to the LCD module.

The module includes following main blocks:

- – Keyboard
- – Illumination
- – Audio block
- – LCD Module interface

Keyboard scanning and display driver control

COL(0–4) are used as column lines in keyboard. UIF(0–5) are used as row lines. They are also multiplexed with display driver control signals.

When a key is pressed the ASIC gets an interrupt from a row and the MCU starts scanning. One column at a time is written to low and rows are used to read which key it was. The power off detection is multiplexed with one row; when all keys on the row seems to be pressed the ASIC knows that power key is pressed. The power key is also connected to PSL+ to switch the power on.

Keyboard and display illumination

The keyboard illumination is achieved by using two transistors wired as simple constant current sinks. Each transistor supplies eight leds. The bases of the transistors are all wired together and supplied by emitter follower V40. The led current is fixed by the values of R44 and R45 and the ratio of R51 to R52.

The display illumination operates in a similar way to the keyboard drivers, two transistors are used to drive eight LED's. The current in this case is defined by the value of R46, R47 and the ratio of R51 to R52.

The Call LED is fed from a simple emitter follower.

Audio Circuitry

The earpiece is routed directly via series resistors to connector X4. The earpiece is dynamic type.

The microphone is of the electric type and needs a voltage supply for operation. When MIC_ENA is low bias voltage is connected to the microphone via transistor V8. V2 is wired as a switch for VA2, controlled by the microphone enable line [MICENA].

The buzzer is a dynamic one and is driven from a two transistor switch which acts as a buffer for a CMOS output signal applied at BUZZER. The ringing volume is controlled by pulse width modulation.The diode V37 prevents damage to the transistor when switched off, absorbing the stored energy in the buzzer inductance and suppressing large positive going spikes on the transistor collectors.

LCD Module Interface

The LCD module includes the LCD and the display driver. The driver TAB is connected with heat seal connection to the LCD. Viewing direction is 6 o'clock. It has internal clock oscillator and negative voltage generator. The display module is connected to the UIF module with 24 pin soldered connection.

The display module contains an oscillator to generate a negative voltage required for operation. The oscillator frequency is fixed on the UIF module by the resistance from pins 2 to 3 of X1, with the values of R6 and R16 shown, the frequency is within 180 kHz to 370 kHz. The negative going pulses appear at pin 9 of X1 where they are smoothed by C1 to give a voltage which is nominally equal but opposite to VL1.

For correct operation of the display, DC voltages between –VL1 and VL1 need to be generated and fed back to the driver chip, at pins 4 to 8 inclusive (of X1). The exact voltages depend on the relative values of the resistors R21, R37, R38, R39, R40 and R33.

Power Distribution Diagram

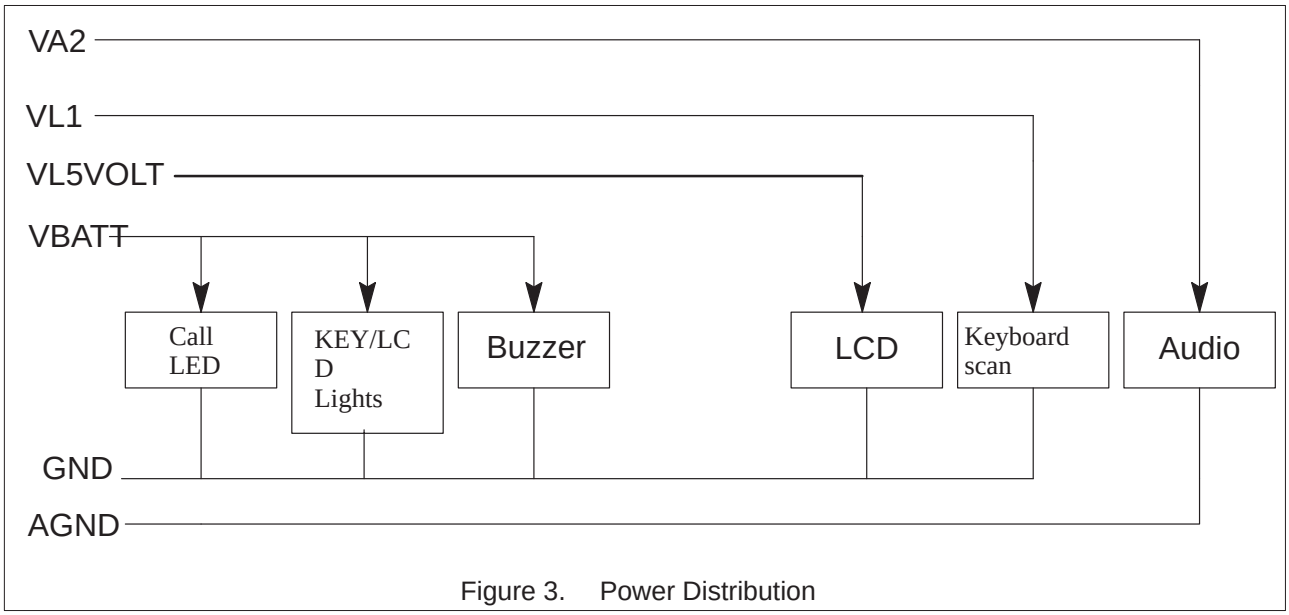

Figure 3. Power Distribution

Parts List – DU8D_06

p.n 0200521 EDMS issue 12.0

Item	Code	Description	Value	Type
R002	1430144	Chip jumper		0603
R003	1430144	Chip jumper		0603
R004	1430075	Chip resistor	33 k	5 % 0.063 W 0603
R005	1430087	Chip resistor	100 k	5 % 0.063 W 0603
R006	1430057	Chip resistor	8.2 k	5 % 0.063 W 0603
R009	1430087	Chip resistor	100 k	5 % 0.063 W 0603
R010	1430087	Chip resistor	100 k	5 % 0.063 W 0603
R011	1430087	Chip resistor	100 k	5 % 0.063 W 0603
R012	1430087	Chip resistor	100 k	5 % 0.063 W 0603
R013	1430087	Chip resistor	100 k	5 % 0.063 W 0603
R014	1430087	Chip resistor	100 k	5 % 0.063 W 0603
R015	1430087	Chip resistor	100 k	5 % 0.063 W 0603
R016	1430085	Chip resistor	82 k	5 % 0.063 W 0603
R017	1430087	Chip resistor	100 k	5 % 0.063 W 0603
R018	1430087	Chip resistor	100 k	5 % 0.063 W 0603
R021	1430075	Chip resistor	33 k	5 % 0.063 W 0603
R022	1430045	Chip resistor	2.7 k	5 % 0.063 W 0603
R023	1430045	Chip resistor	2.7 k	5 % 0.063 W 0603
R024	1430045	Chip resistor	2.7 k	5 % 0.063 W 0603
R025	1430045	Chip resistor	2.7 k	5 % 0.063 W 0603
R026	1430045	Chip resistor	2.7 k	5 % 0.063 W 0603
R028	1430075	Chip resistor	33 k	5 % 0.063 W 0603
R029	1430065	Chip resistor	10 k	5 % 0.063 W 0603
R030	1430045	Chip resistor	2.7 k	5 % 0.063 W 0603
R031	1430045	Chip resistor	2.7 k	5 % 0.063 W 0603
R033	1430069	Chip resistor	18 k	5 % 0.063 W 0603
R035	1430045	Chip resistor	2.7 k	5 % 0.063 W 0603
R037	1430063	Chip resistor	12 k	5 % 0.063 W 0603
R038	1430063	Chip resistor	12 k	5 % 0.063 W 0603
R039	1430063	Chip resistor	12 k	5 % 0.063 W 0603
R040	1430063	Chip resistor	12 k	5 % 0.063 W 0603
R044	1430165	Chip resistor	39	5 % 0.063 W 0603
R045	1430165	Chip resistor	39	5 % 0.063 W 0603
R046	1430165	Chip resistor	39	5 % 0.063 W 0603
R047	1430165	Chip resistor	39	5 % 0.063 W 0603
R048	1430045	Chip resistor	2.7 k	5 % 0.063 W 0603
R052	1430053	Chip resistor	5.6 k	5 % 0.063 W 0603

R054	1430087	Chip resistor	100 k	5 % 0.063 W 0603
C001	2604248	Tantalum cap.	4.7 u	20 % 16 V 6.0x3.2x2.5
C002	2604431	Tantalum cap.	10 u	20 % 16 V 6.0x3.2x2.5
C004	2604248	Tantalum cap.	4.7 u	20 % 16 V 6.0x3.2x2.5
C005	2307816	Ceramic cap.	47 n	20 % 25 V 0805
C006	2307816	Ceramic cap.	47 n	20 % 25 V 0805
C007	2307816	Ceramic cap.	47 n	20 % 25 V 0805
C008	2307816	Ceramic cap.	47 n	20 % 25 V 0805
C009	2307816	Ceramic cap.	47 n	20 % 25 V 0805
C010	2307816	Ceramic cap.	47 n	20 % 25 V 0805
C013	2604209	Tantalum cap.	1.0 u	20 % 16 V 3.2x1.6x1.6
C014	2320041	Ceramic cap.	18 p	5 % 50 V 0603
C015	2320041	Ceramic cap.	18 p	5 % 50 V 0603
C021	2320041	Ceramic cap.	18 p	5 % 50 V 0603
C023	2307816	Ceramic cap.	47 n	20 % 25 V 0805
C026	2307816	Ceramic cap.	47 n	20 % 25 V 0805
C027	2307816	Ceramic cap.	47 n	20 % 25 V 0805
C030	2320041	Ceramic cap.	18 p	5 % 50 V 0603
C031	2320041	Ceramic cap.	18 p	5 % 50 V 0603
C040	2320107	Ceramic cap.	10 n	5 % 50 V 0603
B001	5140125	Buzzer 90db 2700hz 5.0v d9.0x5.5		
B002	5140446	Cond. microphone 62+–2DB 2.2K PCPCB		
B003	5140576	Speaker 95.5+–2DB 32R D20X2		
V002	4200829	Transistor	BC859C	pnp 30 V 0.1 A SOT23
V003	4200811	Transistor	BC849C	npn 30 V 0.1 A SOT23
V004	4200836	Transistor	BCX19	npn 50 V 0.5 A SOT23
V005	4200811	Transistor	BC849C	npn 30 V 0.1 A SOT23
V008	4200811	Transistor	BC849C	npn 30 V 0.1 A SOT23
V010	4864384	Led Red	0603	
V011	4864388	Led Green	0603	
V012	4864388	Led Green	0603	
V013	4864388	Led Green	0603	
V014	4864388	Led Green	0603	
V015	4864388	Led Green	0603	
V016	4864388	Led Green	0603	
V017	4864388	Led Green	0603	
V018	4864388	Led Green	0603	
V019	4864388	Led Green	0603	
V020	4864388	Led Green	0603	
V021	4864388	Led Green	0603	
V022	4864388	Led Green	0603	
V023	4864388	Led Green	0603	
V024	4864388	Led Green	0603	

V025	4864388	Led	Green	0603
V026	4864388	Led	Green	0603
V027	4864388	Led	Green	0603
V028	4864388	Led	Green	0603
V029	4864388	Led	Green	0603
V030	4864388	Led	Green	0603
V031	4864388	Led	Green	0603
V032	4864388	Led	Green	0603
V033	4864388	Led	Green	0603
V034	4864388	Led	Green	0603
V036	4111824	Diode	BAS16	75 V 250 mA 6 ns SOT23
V037	4111824	Diode	BAS16	75 V 250 mA 6 ns SOT23
V040	4200811	Transistor	BC849C	npn 30 V 0.1 A SOT23
V041	4200836	Transistor	BCX19	npn 50 V 0.5 A SOT23
V042	4200836	Transistor	BCX19	npn 50 V 0.5 A SOT23
V043	4200836	Transistor	BCX19	npn 50 V 0.5 A SOT23
V044	4200836	Transistor	BCX19	npn 50 V 0.5 A SOT23
	4850038	IC, lcd 42dotm 3x7sgm 57ind		DSL–12 EU
	9460074	Light guide 4c23228 nhj–		1DA
	9460075	Microphone rubber 4d22908 nhj–1DNHJ–1DA		
	9480061	Reflector 3c22893 nhj–1DA		
	9480078	Buzzer gasket		4D23092 NHK–1XA
	9480103	Speaker pad2		4D23517 NHK–1XA
	9480134	Speaker gasket		4D24016 NHK–1XA
	9795021	Main keydome		3C26395 NHC–4NX
	9795022	Side keydome		4C26397 NHC–4NX
	9855017	PCB DU8D 50.0X141.0		
	9855017	PC board	DU8D	50.0x141.0